

WHAT IS CLAIMED IS:

1. A method for modifying a surface of a substrate to be processed, by utilizing microwave
5 surface-wave plasma, said method comprising the steps of:

maintaining a temperature of the substrate to a temperature which substantially prevents a material injected by a plasma process into the substrate from
10 diffusing in the substrate, and provides an anneal effect;

introducing process gas including the material into a plasma process chamber;

generating plasma in the plasma process
15 chamber; and

changing at least once an electron temperature of the plasma.

2. A method according to claim 1, wherein said
20 changing step changes a pressure of the plasma process chamber.

3. A method according to claim 1, wherein said
changing step changes a mixture ratio of the process
25 gas introduced into the plasma process chamber.

4. A method according to claim 1, wherein said changing step changes a distance between a generation part for generating the plasma and a stage for mounting the substrate to be processed.

5

5. A method for modifying a surface of a substrate to be processed by utilizing process gas that includes a predetermined material, and microwave surface-wave plasma, said method comprising the steps

10 of:

turning the process gas into the plasma, injecting the plasma into the substrate, and forming at least two concentration distributions of the material on the surface of the substrate; and

15 maintaining a temperature of the substrate to one which prevents the material from diffusing beyond a predetermined depth in the substrate, and which maintains defect density of the substrate below a permissible value.

20